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PROGRESS OF THE DEMARCATION OF THE ALASKA BOUNDARY.

By O. H. TITTMANN,

U. S. COMMISSIONER.

(Read April 24, 1908.)

The boundary between the British and Russian possessions in North America was defined by the Treaty of St. Petersburg of 1825. When the United States purchased the Russian possessions, or Alaska, in 1867, it was believed that the territorial jurisdiction of the United States and Great Britain could not become a matter of controversy. This view is evidenced by the remark made by Charles Sumner in his speech advocating the purchase of Alaska. "I am glad," said he, "to begin with what is clear and beyond question. I refer to the boundaries fixed by the treaty."

The total length of the boundary referred to by Mr. Sumner is twelve hundred miles. It divides itself naturally into two sections of about six hundred miles each. One is the section bounded by the 141st meridian, and the other the irregular boundary delimiting the narrow coast strip of southeastern Alaska. No dispute has ever arisen as to that part of the boundary defined as being the 141st meridian of longitude west of Greenwich. As is well known, however, a contention arose as to that part of the boundary which delimits the stretch of coast extending from the neighborhood of Mt. St. Elias southeasterly to and through the Portland Canal. A *modus vivendi* in 1878, affecting the Stikine River, and another in 1899, relating to the country at the head of Lynn Canal, made temporary provision for customs and police purposes. The dispute relating to that part of the boundary was happily settled by the Tribunal of London which was constituted under a convention signed at Washington January 24, 1903.

Hon. John W. Foster, the agent of the United States in this important case, remarks in his report to Secretary Hay:

"It is a noteworthy fact that this important adjudication was brought to a close within less than eight months from the time when the treaty creating the tribunal went into effect. Such a prompt result is almost without parallel in the intercourse of nations."

Equally prompt was the action of the governments in appointing commissioners in accordance with a requirement of the convention constituting the Tribunal. Within a few months, that is, in the spring of 1904, the commissioners, Mr. W. F. King, on behalf of the British Government, and your speaker, representing the United States, began the delimitation of that part of the boundary which had been in dispute. The commissioners were guided in their plans by maps, accompanying the decision, on which the Tribunal had marked certain mountain peaks as being the mountains contemplated by the Treaty of 1825.

It is the business of the commissioners to identify the peaks, to establish their geographical position, to mark by visible monuments, wherever possible, the turning points in the line and such other points as may be necessary, and to describe and define the line between the points selected by the Tribunal. There was a stretch of about one hundred and twenty miles where the topographic information was insufficient, and there the commissioners were directed to make additional surveys and to select mountain peaks within certain prescribed limits to define the boundary. The commissioners decided to mark at once certain river crossings and the mountain passes and to connect all the boundary peaks by a continuous triangulation based on the trigonometric datum adopted by the Coast and Geodetic Survey for southeastern Alaska.

The boundary line, starting from the neighborhood of Mt. St. Elias, crosses that summit and other high peaks of the St. Elias Alps and the Fairweather Range. In general, it lies amid perpetual snow and ice except when it drops abruptly into the river valleys only to rise again into regions of perpetual snow. Finally, it reaches the head of Portland Canal and becomes a water boundary.

In the four years since work was begun on this portion of the boundary the commissioners have fixed trigonometrically all the peaks

except two near Mt. St. Elias and those in the region between the Whiting River and Devil's Thumb, and some of the peaks south of the Unuk River. The passes, valleys and river crossings have been monumented with the exception of the crossing of the Alsek in the north and the valleys of the affluents of the Iskut and the crossing of the Le Duc and Chicamin rivers in the south. The turning points of the water boundary in Portland Canal also remain to be fixed by reference to points on shore.

THE 141ST MERIDIAN.

According to the Treaty of 1825 the 141st meridian west of Greenwich forms the eastern boundary of Alaska from the Arctic Ocean to near Mt. St. Elias. It was not until 1889—twenty-two years after the acquisition of Alaska—that any steps were taken by our government towards establishing the location of the 141st meridian on the ground. In that year the Coast and Geodetic Survey despatched one party to the Yukon and another to the Porcupine River to determine the boundary crossing of those rivers. The Canadian government had previously sent an engineer to the Yukon who made an astronomical determination of the boundary in the autumn and winter of 1887. The country at that time was very inaccessible and the surveyors were compelled to determine the longitude by moon culminations and occultations, and the American parties spent a whole winter in observing them. But the operations of the three parties were not carried on under an international agreement and the results therefore were not reciprocally binding on the governments concerned.

The discovery of gold and the general development of the country, however, caused the construction of a Canadian telegraph line overland to Dawson and beyond, and later the United States government laid a cable from Seattle to Sitka and thence to Valdez on Prince William Sound, whence an overland line was built by the United States War Department as far as Fort Egbert on the Yukon near the boundary. Egbert and Dawson were also connected by telegraph. This important auxiliary to longitude determination made it possible for the two governments to determine the position of the 141st meridian with all the necessary accuracy as soon as an

agreement was reached and embodied in the treaty signed at Washington in August, 1906. This treaty provided for the survey and demarcation of the line and before the end of that summer the telegraphic determination of the Yukon River crossing of the 141st meridian had been completed. The telegraphic determination made by the Americans rests on the known longitude of Seattle. Signals were exchanged between Sitka and Seattle, Seattle and Valdez, Valdez and Fort Egbert, Fort Egbert and the boundary. That made by the Canadians rests on the longitude of Vancouver between which place and the boundary time signals were exchanged. As the difference between Seattle and Vancouver was also determined by the commissioners, the circuit was closed and a very satisfactory agreement was obtained.

It is worthy of remark in passing that the tracing of a meridian or parallel on the ground involves considerations which do not become apparent by an inspection of an artificial globe on which these lines are traced as smooth and regular curves. A parallel of latitude must be determined by astronomical observations, but in general the circumference of a small circle of the earth parallel to the equator will not lie in the same astronomical latitude, owing to the so-called deflection of the vertical. A series of points determined astronomically as being in the same latitude or, as in the case of a meridian, in the same longitude, will therefore in general produce on the surface of the earth a zig-zag line when they have been joined together.

In order to avoid all questions that might arise from local deflections of the zenith, it was provided by the Treaty of 1906 that the commissioners should determine by the telegraphic method a convenient point on the 141st meridian and then trace a north and south line passing through the point thus ascertained. This provision fixed the telegraph crossing of the boundary as the initial point for the longitude determination. The commissioners desired to make the determination as nearly on the 141st meridian as possible, in order to avoid a deflection error which might have been involved if the longitude had been obtained by linear measurement from a longitude observed at some distance from the boundary. The transit pier erected for the purpose of exchanging time signals was found

to be in longitude $141^{\circ} 00' 00''.4$, a very close hit. It is interesting to note also that the final longitude differed only $9''.43$ of an arc, or 410 feet, from that derived by moon culminations about twenty years before.

The work of tracing the boundary southward from the Yukon was begun in the spring of 1907 and was carried southward a distance of about one hundred and twenty miles. Aluminum-bronze monuments were erected on the north and south banks of the river, a trigonometric and topographic survey was made extending two miles on each side of the boundary for a distance of about forty-five miles, and a broad vista was cut through the woods for the same distance. The work planned for the coming season will carry the tracing of the line as far as the great mountains south of the White River, and the topographic survey and the monumenting will be pushed until the severity of the weather compels the surveyors to abandon the work and turn their faces homeward.